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Statement

by

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before

Senate Committee on Energy and Natural Resources
Subcommittee on Energy Research and Development

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Mr. Chairman and members of the committee, my name is Thomas B. Cochran. I have a Ph.D. in physics from Vanderbilt University. I am presently a Staff Scientist at Natural Resources Defense Council here in Washington, D.C. Since 1971 I have been closely following Federal energy R&D policy, focusing principally on the breeder reactor program, proliferation of nuclear weapons and other plutonium related issues.

When this committee held hearings on the breeder last March 28, my colleague Arthur Tamplin and I submitted for the record a brief statement and three reports. The latter included a critique of ERDA's FY-1978 energy budget, a report setting forth an alternative LMFBR program, and a report detailed analysis of the risks associated with the proliferation of nuclear weapons supporting why it is of utmost importance and urgency for the U.S. to unequivocally reject the idea of reprocessing nuclear fuel for plutonium recovery in the foreseeable future either here or abroad.

Russell Train, Frank von Hippel, Robert Williams and I co-authored "Proliferation Resistant Nuclear Power Technologies: Preferred Alternatives to the Plutonium Breeder", one of two reports of ERDA's LMFBR Review Steering Committee. I would like to submit this for the record. At this time, I would like to highlight several key issues in the plutonium breeder debate that were covered in this report and the previously submitted material.

Much of the public debate has focused at long last on the nuclear weapons proliferation issue. The proliferation problems posed by existing reactors that do not rely on reprocessing and the recycling of plutonium are complex and dangerous, but perhaps

not impossible to manage. However, controlling nuclear weapons proliferation will certainly become impossible, if the nuclear industry here and abroad launches its proposed next step: nuclear fuel reprocessing for the purpose of plutonium recycle and wide-scale deployment of plutonium breeder reactors.

As Russell Train has noted, "If tomorrow we were to ship, no questions asked, a stock of weapons grade nuclear material to Colonel Quaddafi of Libya, or to President Amin of Uganda, the result would be a small sample of what nuclear proliferation is all about." *

Once reprocessing is sanctioned, large flows of recovered plutonium and plutonium stockpiles will become a worldwide reality. It is important that you appreciate the magnitude of this problem. At each annual refueling enough plutonium to construct several hundred nuclear weapons would be removed from (and loaded into) each commercial size LMFBR. A commercial size fuel reprocessing plant for breeder fuels would recover annually sufficient plutonium to construct up to ten thousand nuclear weapons. The most ardent breeder supporters cannot fabricate a favorable benefit-to-cost ratio for the breeder program without projecting a market of one or two thousand breeders and about 8 to 16 fuel reprocessing plants in the U.S. alone. The commercial flows of nuclear weapons materials in a world of plutonium breeders are truly staggering.

The reprocessing of spent fuel and the recycling of plutonium** in fresh fuel for reactors would allow non-nuclear weapons states

* Additional Statement of Russell E. Train, "Proliferation Resistant Nuclear Power Technologies: Preferred Alternatives to the Plutonium Breeder", April 6, 1977.

** Or any other weapons material, such a highly enriched uranium-235 or uranium-233.

to acquire and stockpile plutonium - seemingly for peaceful purposes. Without violating any of the international safeguards agreements, they could design and fabricate weapon components and move to a point of being as little as hours away from having nuclear weapons - perhaps needing only to introduce the plutonium into the weapons. A non-nuclear weapons state in such an event would have all of its options open. Under these conditions, international safeguards agreements would serve as a cover for a nascent weapon state; concealing the signs of a critical change until it is too late for diplomacy to reverse the decision to "go nuclear." The international safeguards regime designed to provide "timely warning", loses its effectiveness when the weapons option is placed on a hair-trigger.

For these and other reasons, I seriously doubt that either national commercial size reprocessing plants or mixed-oxide fuel fabrication plants can ever be subjected to effective international safeguards - that is, safeguards which provide a high probability that diversion of weapons material can be detected in a timely fashion. In any case a non-nuclear weapons country would always have the option to shift its "peaceful" nuclear program to a weapons program. Countries that have national reprocessing facilities and breeder reactors could therefore circumvent the very considerable political problems and cost inherent in building facilities dedicated to the production of large quantities of weapons-grade plutonium by establishing their nuclear weapons option through their nuclear electric generation program.

Given the marginal economics of reprocessing and plutonium recycle for today's reactors, acceptance of this option by a non-

weapons state must be considered as primarily the pursuit of a nuclear weapons option. The mere acceptance of the plutonium breeder as a potential U.S. energy option legitimizes the plutonium technology and provides the justification for the early development of a reprocessing facility by any country.

In response to these realities we are told, "The plutonium genie is out of the bottle" "If we don't build plutonium breeders, the French and the Germans will" "We must pursue our plutonium program so that through our leadership role we can foster more effective international safeguards." We must refuse to accept these self-justifying statements of the entrenched nuclear establishments. These arguments are strikingly similar to those used in the 18th century in defense of the slave trade. About half of the trade was conducted by British merchants. In debates in the British Parliament, it was argued that the British could not abolish the slave trade; they could only relinquish it to the Spanish and the Dutch. The British, it was said, should stay in the trade to insure the humane treatment of the slaves.

One only has to look back at the statements endorsing breeder reactors made by the previous Administration as little as a year ago in order to perceive that change is possible. It is not only possible but highly probable, not only here, but worldwide. The Administration's policy is working. The French delivery of a reprocessing plant to Pakistan is not going through. West Germany has cut back on its plutonium breeder research. Britain has called for extensive public hearings prior to moving ahead with its reprocessing plant or its CFR-1 breeder. The Japanese reprocessing plant

has not started up. As my colleague Arthur Tamplin has made clear in a May 13 letter to several of you, a failure by the Congress to give the Administration's nuclear non-proliferation policy time to work, displays a lack of confidence in the democratic process and/or a lack of knowledge of developing political forces in the rest of the world. I would like to submit copies of Dr. Tamplin's letter for the record.

While I have emphasized, here, the nuclear weapons connection, there are half-a-dozen other excellent reasons for canceling the Clinch River Breeder Reactor (CRBR) Demonstration Project. To borrow a phrase coined by Marvin Goldburger in the ABM debates, the CRBR, if not the entire U.S. breeder program, is "spherically senseless", that is, it doesn't make sense any way you look at it: a) the program is experiencing enormous cost overruns; b) it cannot be justified by any credible benefit-cost analysis; c) a commitment to the LMFBR program would require massive Federal expenditures - in excess of \$30 billion - that would rob other more appropriate energy technologies; d) the CRBR design is obsolete; e) the reactors explosive potential is unknown; f) I am confident the present design is unlicensable at the Clinch River site; and most importantly, g) the fuel cycle facilities for the CRBR cannot be adequately safeguarded even in the U.S. short of turning them into Federally controlled armed camps.

I am told that Dr. Edward Teller said recently, "Twenty years ago we were ten years away from a commercial breeder; twenty years later we are thirty years away." I might add, ten years ago this was a two billion dollar program. Two years ago it was a \$12 billion dollar program. With Federal subsidies required for the first few commercial size LMFBRs and the plutonium fuel cycle, one can easily

demonstrate that it will now cost at least \$30 billion. Three years ago ERDA was projecting 400 commercial LMFBRs by the year 2000. One year ago, GAO was saying the number is more probably 4, and now it's clear that even these would have to be heavily subsidized at a cost to the U.S. government of over a billion dollars each. Three years ago ERDA was justifying the breeder on the basis of a growth rate in electricity demand between 1975 and 2000 that averaged about 6 percent. Utility generated electricity is more likely to grow at half this rate.*

Five years ago the AEC was projecting 1200 GW of nuclear power by the year 2000. Over the last several years ERDA has repeatedly revised its nuclear growth projections downward. Current estimates are now 300-400 GW - down by 1/3 to 1/4. With nuclear plant cancellations still outpacing sales, we are now on the verge of seeing the U.S. nuclear power supply capability disintegrate in the face of a near-vacuum of new orders that is now approaching three years duration.

Given these realities the breeder proponents no longer try to justify the program economically. The breeder program is now being offered as an insurance policy. "We may run out of uranium," we are now told. Arthur Burns may not know it but for the breeder proponents uranium has replaced the dollar as the measure of value. A "uranium gap" has replaced the "missile gap". It is hard to envision running out of domestic uranium when reactor cancellations are outstripping reactor sales, when two of the four remaining vendors are on the verge of abandoning ship for lack of new sales.

* "Proliferation Resistant Nuclear Power Technologies: Preferred Alternatives to the Plutonium Breeder," LMFBR Steering Committee Report, April 6, 1977, pp. IV-3 to IV-11.

Nevertheless, the breeder proponents have found five geologists to criticize the estimates of ERDA's uranium geologists as being too optimistic, whereas resource economists traditionally have criticized these same estimates as being too conservative.*

Even under the most pessimistic assumptions about uranium supplies, the LMFBR still does not make sense. As noted in our LMFBR Review Steering Committee report, and the attached April 12 letter to Dr. Schlesinger from von Hippel and Williams:

"Fuel cycles that are far more proliferation-resistant than a fuel cycle founded on the use of plutonium in LMFBRs and far more uranium-conserving than the current once-through fuel cycle employed by today's LWR technology can be developed with only minor changes in today's reactor technology. For example, slightly modified versions of today's pressurized water reactors operated on a denatured uranium-thorium fuel cycle could support a nuclear generating capacity that would provide for a hundred years more electric power than is generated on the average by the entire US electric utility system today, using only about two thirds of the uranium in US high grade uranium ore deposits, as officially estimated by ERDA.

Even if the most pessimistic forecasts of high grade US uranium resources should be realized, the large amounts of uranium in low grade ores such as the Chattanooga shale, which could not be used in today's reactors, would be an economically viable backup resource for uranium conserving light water reactors operating on a denatured uranium-thorium fuel cycle.

* "Proliferation Resistant Nuclear Power Technologies: Preferred Alternatives to the Plutonium Breeder," LMFBR Steering Committee Report, April 6, 1977, pp. IV-11 to IV-14.

The proliferation potential of the LMFBR would not be greatly reduced by operating this reactor on a denatured uranium-thorium fuel cycle. While modified versions of LWRs or Candu-type HWRs optimized to operate on a denatured uranium-thorium fuel cycle would produce very little plutonium, fast breeder reactors operated on this fuel cycle would produce a great deal - roughly as much plutonium as U-233. A major purpose of the denatured uranium-thorium fuel cycle - to minimize the production and transport of plutonium - would therefore be defeated.

A mere shift of the CRBR to a thorium based fuel cycle would not provide a clear signal of U.S. intentions to develop proliferation resistant nuclear technologies but would likely be perceived both here and abroad as foolish or dishonest or both. Because this fuel cycle is technologically unsuited for the LMFBR and because it does not provide clear non-proliferation advantages, this move would likely be viewed as a marking of time until a new Administration or Congress more tolerant of plutonium use would allow the operation of LMFBRs on the uranium-plutonium fuel cycle, for which the technology was originally designed.

While fast breeder reactors could provide a 10,000 + year energy supply, the proliferation risk is inherently high for this technology. It would be extremely foolhardy to move now toward commercialization of this technology when much more proliferation resistant technologies that can provide a 100-200 year energy supply are close at hand. For the very long term our options are so diverse that potentially high breeding ratio technologies such

as the LMFBR may never be needed. We have time to develop more proliferation resistant breeder or near breeder concepts to assure the continued technological viability of the fission option. "

The Administration has recognized the dangers in proceeding with the plutonium breeder and has initiated a program to study more proliferation resistant alternatives. The Administration LMFBR budget request which includes termination of the CRBR is a reasonable first step toward a more sane nuclear R&D policy. This budget does not kill the LMFBR program. Under the President's proposal the LMFBR would still remain the largest single energy R&D program in the Federal budget.

The Congress would be well advised to make further cuts in the LMFBR program. I would recommend that the FY-1978 B/A be reduced at least to about \$300 million. For the next few budget cycles ERDA's advanced reactor program should pursue only theoretical studies of more proliferation resistant technologies. They should be given just enough money to think, nothing more.